



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

A PATHOGENIC SCHIZOPHYTE OF THE HOG.

BY PROFESSOR H. J. DETMERS.

(Continued from March number.)

A LITTLE over a year ago I had a chance to make an incidental investigation of a few cases of Texan fever, and besides other bacteria found several large bacilli, several micros in length. These bacilli developed large helobacteria, containing each one or two lasting spores. If the observations of others are correct, and I have no doubt they are, these lasting spores, when their time comes, burst, and discharge a cloudy mass, which is supposed to consist of exceedingly minute germs, too small to be distinctly seen with the very best objectives at our disposal. These minute germs, it is further supposed, develop and grow, and finally form the micrococci of the Schizophytes to which the helobacteria and the lasting spores belong. The helobacteria, which I found in swine-plague, bear, as to size, about the same relation to the swine-plague Schizophytes, as the helobacteria found in Texan fever to the bacilli, which presented themselves in that disease; consequently, as the former were found so often, and frequently in perfectly fresh material, before any other Schizophytes except those of swine-plague, and particularly before any putrefaction bacteria had made their appearance, there is, in my judgment, just cause to suppose that these helobacteria are but another stage of development of the bispherical swine-plague Schizophytes, and that the germs of the swine-plague micrococci are the product of the lasting spores. At any rate, if such is the case, the whole cycle of development and propagation is complete, and a great many things are at once explained which otherwise cannot be accounted for.

These lasting spores, undoubtedly, like those of some other Schizophytes, possess great vitality; are able to withstand degrees of heat and cold and other adverse influences absolutely destructive to the Schizophytes in any other form or stage of development. I have abundant proof—the same has been published in my reports to the Commissioner of Agriculture—that the vitality of the infectious principle of swine-plague, or what is the same, of the Schizophytes of swine-plague, can be preserved under certain conditions, or in certain media—in an old straw stack for instance—a whole year, and possibly much longer. If the swine-

plague Schizophytes did not develop helobacteria or lasting spores, such a long preservation, to say the least, would be difficult to comprehend, even if an indefinitely continued and uninterrupted propagation of the Schizophytes by fission should be possible, for an old straw stack, although affording excellent protection on account of its porosity, and by being a poor conductor of heat, does not seem to be capable of providing the necessary pabulum for innumerable generations for a whole year, or longer, without changing the malignant character of the Schizophytes, while, when cultivated in fluids, foreign to the body of the hog, the same Schizophytes undergo an observable change as to their malignancy—become less capable of producing mischief—in a few generations. Further, the swine-plague Schizophytes, while in the state of a single or double micrococcus, of a coccoglia, or of a micrococcus chain, are known to succumb in a comparatively short time to adverse influences, and it is very much to be doubted whether they possess vitality enough to be preserved a whole year, or longer, in a dormant state, even if protected by such a porous body as an old straw stack. Moreover, for reasons already stated, it would be impossible to account for the multitude of single micrococci invariably present in all infectious material, unless the swine-plague Schizophytes develop helobacteria and lasting spores, which produce germs developing to micrococci. If animal fluids, lung-exudation for instance, containing swine-plague Schizophytes, are filtrated through several papers, the latter, if fine enough, retain the micrococcus-chains, the zoöglœa-masses, most, or nearly all of the double, and a good many of the single micrococci, while some of the latter, no matter how fine the papers may be, will pass through. But as the single or spherical micrococci of swine-plague are not a product of fission—do not proceed from micrococcus-chain, zoöglœa-masses, or double micrococci—and do not come from other single micrococci, which, as far as I have been able to observe, develop to double or bispherical bodies, in as well as out of the zoöglœa-mass, the fact that in a few hours or, at any rate, in a day after the filtration, the number of single micrococci contained in the filtrate is much larger than immediately after the filtration, cannot be explained, unless something finer than the micrococci, in other words, some micrococcus germs or the products of the lasting spores, too fine to be distinguished by the human eye

through the best lenses in use, must have been contained in the lung-exudation, and must have passed through the filtering papers. Still, when the filtrate containing the micrococci, was filtrated again and again, each time through four papers, and at such a time, at which most or nearly all of the micrococci had become double, or developed to chains, but before any helobacteria had formed or could be found, the filtrate finally became free from micrococci, and an inoculation with the same proved to be ineffective, while an inoculation with the filtrate containing micrococci, produced a mild form of disease. Hence, it must be supposed, time and repeated filtrations finally exhausted the existing supply of micrococcus-germs or lasting spore products. Some French investigators, indeed, have found that in Anthrax not only the bacilli, but also their products (?), if used for inoculation, produce the disease. Does it not seem probable that these products are nothing but the germs discharged by the lasting spores, which are contained in the infectious media, invisible to the human eye even through the best objectives, because too small?

Finally, as single micrococci do not develop from other single micrococci, and are not a product of fission, they cannot increase in numbers in the animal organism—for instance, after an inoculation—unless we accept spontaneous generation, or unless there is another link in the cycle of metamorphosis, a helobacterium or lasting spore, which produces and disseminates the germs or seeds of the new micrococci. Therefore, as such helobacteria or lasting spores are of frequent occurrence, and can very often be found in perfectly fresh material, such as lung-exudation, blood serum, etc., before any other bacteria besides swine-plague Schizophytes have made their appearance, and also correspond in size to the swine-plague Schizophytes the same as the helobacteria found in Texan fever to the bacilli found in that disease, it will be pretty safe to conclude that the helobacteria in question are simply an advanced and matured form of the swine-plague Schizophytes. The discharged contents of such a lasting spore, though undoubtedly granular, are too fine to be resolved by our present objectives.

But what proof is there that these Schizophytes, which I call swine-plague Schizophytes, really constitute the cause and the infectious principle of that disease, and are not the products of

the morbid process, or merely accidental attendants. To show that their presence is not accidental, may not need much proof, although an abundance can be furnished. It will probably suffice to say, if the Schizophytes were accidental, that is, had no relation to the disease, neither as cause nor as effect, it would be very strange that they are found in every case of swine-plague and nowhere else. It may be said that some investigators did not find them, but that proves nothing. They are easily overlooked. If one, for instance, has blood or blood serum under the microscope, and focusses on the blood corpuscles, the microphytes, and especially the micrococci, are easily overlooked, particularly if the objective has a short focus and a large aperture, and therefore but little penetration, but the same will come into view if the focus is very slightly raised, or just enough to make the outlines of the blood corpuscles a trifle less distinct, because the Schizophytes, it seems, have a tendency to crowd as close to the cover as they possibly can. Some of them also crowd to the slide, and may therefore be brought to view by lowering the focus just a trifle. Besides, to distinguish under all circumstances, Swine-plague micrococci from small granules, and *vice versa*, requires some experience, a very good objective, good light and careful handling. Further, if one attempts to find Schizophytes in undiluted blood he will very often not succeed, because the blood corpuscles, if very thick or numerous, are apt to hide them from view.

In all my examinations of blood, blood serum, lung-exudation and other morbid products of swine-plague, I never found the swine-plague Schizophytes absent, while on the other hand, I never found them anywhere else. It is true I have found similar single and double micrococci and micrococcus-chains in other substances; for instance, in wine, but the same differed in size, and behaved differently in forming zoöglœa-masses and micrococcus-chains. Those which I found in some substances were considerably smaller, while in some others I found larger ones.

If the possibility of spontaneous generation is admitted, it will be difficult to advance direct proof that the swine-plague Schizophytes are not the product of the morbid process, because in a certain sense they are; they multiply within the animal organism, and multiply very rapidly, and probably in the same ratio, in which the morbid process progresses, if once introduced from the

outside. If, however, the possibility of a spontaneous generation is not admitted, the Schizophytes cannot be produced, or be called into existence by the morbid process.

As evidence that the swine-plague Schizophytes constitute the true cause of the morbid process, and the infectious principle of the disease, by which the latter is communicated from animal to animal, from herd to herd, and from one locality to another, I can offer the following facts, which may not constitute absolute proof, but, if considered in toto, make it reasonably certain that the Schizophytes, and nothing else, constitute the cause and the infectious principle of the disease.

1. Every inoculation of healthy pigs which never had become infected with swine-plague, when made with material containing swine-plague Schizophytes—lung-exudation for instance—proved to be effective, and produced the disease in due time, between three and fifteen days, or on an average in five to six days, notwithstanding the very small quantity, usually not exceeding the fourth part of one drop, with which the animal was inoculated on the outer surface of the ear, provided no measures of prevention were applied. For particulars I have to refer to my published reports. Further, even an inoculation with filtrated lung-exudation, in which no visible solid bodies whatever, except Swine-plague micrococci, could be discovered, proved to be effective, and produced a mild form of the disease, while filtrated lung-exudation, destitute of micrococci, when used to inoculate a healthy animal, proved to be ineffective, and did not even cause a visible reaction.

2. Inoculations with swine-plague Schizophytes cultivated in an innocent fluid, such as fresh cow-milk, albumen of a hen's egg, etc., invariably produced the disease, though usually in a comparatively mild form; a fact which corresponds with the results of the experiments, made by Toussaint, Pasteur, and Buchner with *Bacillus anthracis*, and by Pasteur with chicken-cholera microbes, and shows that the malignancy of pathogenic Schizophytes depends largely upon the nature of this pabulum.

3. Swine, which survive an attack of swine-plague and recover, possess afterwards either perfect, or what is more frequent, partial immunity from further infection. In other words, subsequent inoculations, or a subsequent exposure to the influence of the infectious principle, have either no effect whatever, or have only a

comparatively slight effect, that is, are productive of a mild and not fatal form of the disease, or cause only a scarcely observable reaction. All this cannot find an explanation, if the infectious principle consists in a chemical virus, but is fully explained, if Schizophytes constitute the cause and the infectious principle of the disease, for it is a well known fact that these minute bodies, by passing through a certain cycle of changes or metamorphoses, and propagating to a certain extent exhaust in that medium, in which they are existing, the conditions necessary to their further development and propagation. They then render their medium sterile, and do not undergo any further changes, and do not multiply, unless, and until they are transferred to a fresh and otherwise suitable medium, when, again they begin another cycle of metamorphosis and propagation, and multiply with great rapidity. In an animal, which has recovered from an attack of Swine-plague, some of the conditions necessary to the further metamorphosis and propagation of the Schizophytes, it seems, have become either partially or fully exhausted, and are not very soon restored, hence the partial, or as the case may be, perfect immunity. Still, as will be mentioned again, such an animal is usually able, at least within two months after its recovery, to transmit the disease, from which the same itself is not any more suffering, to other healthy animals, though in most cases only in a mild form.

4. It is a well known fact, and has been observed everywhere, not only by myself, but by nearly every one who has any experience in regard to swine-plague, that healthy hogs, which have access to a creek or a small stream of running water, which is further above accessible to, and defiled by, diseased hogs, or polluted with morbid products of swine-plague, or the carcasses of dead hogs, will almost invariably contract the disease; a fact which plainly shows to every thinking man that the infectious principle must be something corporeal, endowed with life, and able, like the swine-plague Schizophytes, not only to withstand the influence of water, but also to live and to multiply in the same. A chemically acting, and invisible fluid, or volatile virus, one should suppose, would become diluted by the water of a creek, small river, or running stream to such an extent as to be perfectly harmless and unable to communicate the disease, because there is no known chemical of an organic nature, but what

can be sufficiently diluted to lose its efficiency. With living germs it is different; if conditions are favorable, a few of them will suffice to develop innumerable generations, and may thus become a source of incalculable mischief. Further, it is also well known that the disease can be communicated through the air, and that the infectious principle which may happen to be floating in the air is absorbed by wounds, scratches, sores, abrasions, etc., in skin and mucous membranes, which would hardly be possible if a chemical virus constituted the cause and the means of infection.

5. The temperature of the atmosphere, and also the weather have considerable influence as to the spreading of the disease, but apparently have no influence whatever upon the morbid process or the development of the disease, after an animal has become infected. Frost, cold weather, lasting snow, frequent heavy rains, and continued drought and sunshine retard, and mild, warm and cloudy weather, heavy dews, and now and then a light rain considerably promote the spreading of the disease. Such would not be the case if the infectious principle consisted in a chemical virus, indestructible by water and air, but all this is natural, easily explained and self-evident, if living germs which require a certain degree of warmth and moisture, constitute the infectious principle, because frost, lasting snow, cold weather, heavy rains, and continued drought are inimical to organic life and vegetation, offer but little opportunity to the Schizophytes for a change of place, and necessarily retard their development and propagation; while, on the other hand, mild and warm weather, heavy dews, light rains, etc., are not only favorable to vegetation in general, and to the development of minute organic bodies in particular, but also offer a great many chances for a change of place and medium, and thus promote the propagation of the Schizophytes. The latter which are discharged in immense numbers with the excrements, urine, discharges from the nose, and other secretions and excretions of the diseased animals, rise into the air, perhaps mostly as micrococcus-germs and micrococci, probably only to a limited height, when the moisture contained in the dung and other excretions, and the urine evaporate, and come down again in the dew, and when it rains. At any rate, where swine-plague is prevailing, the swine-plague micrococci can often be found in dew-drops on the grass early in the morning, and also in exposed pools of

water. If the rain is a light one, the Schizophytes are apt to remain where the rain-drops deposit them, till evaporation once more carries them up into the air, but if the rain is very heavy or pouring, and temporarily flooding the ground, the Schizophytes, it seems, are washed away, for it can be observed that after light rains the spreading of the disease is accelerated, while immediately after each heavy or pouring rain a temporary diminution, often almost amounting to a cessation, can be noticed.

6. As already mentioned, it is an established fact that external wounds, especially such as are caused by ringing, castration, cutting of tails, and slitting of ears, external sores, scratches, and even abrasions, attract and absorb the infectious principle, and that the disease is also communicated, though not as readily as through wounds, etc., if the infectious principle is introduced with food or water for drinking into the digestive canal, while I have never yet been able to observe, or to obtain any evidence, that the infectious principle does enter, or can enter, the animal organism through a healthy skin, or through the respiratory organs, if the mucous membranes are in a perfectly healthy condition, or free from any sores, wounds, or abrasions. It has even been repeatedly observed that an animal whose skin and mucous membranes are whole and healthy, will not contract the disease, and is perfectly safe, if separated only by a fence, a board fence, or a board partition from diseased animals, provided, of course, an introduction of the infectious principle through the alimentary canal is prevented. All this shows that the infectious principle must be something that is very minute, but corporeal, and endowed with life and power of propagation, and not an invisible poisonous fluidum, for the latter, most assuredly, if dissolved in air, would find its way through the lungs, and, very likely also through the healthy skin into the animal organism.

7. If the morbid process is taken into consideration—for particulars I have to refer to my published reports, as going into details would consume too much time—it also becomes evident that something corporeal and endowed with life and power of propagation must constitute the cause of the disease. The morbid process in all parts and organs, in which it may develop, essentially the same, is best studied in the skin, subcutaneous tissues, and particularly in the lungs. At first the finer capillaries become obstructed, as a consequence, more or less blood serum transudes

through their walls into the tissues, or if the pressure is a great one some of the capillaries will yield, and become dilated or break behind the obstruction, and thus small specks of blood are extravasated. These extravasations are sometimes, especially in younger animals, exceedingly numerous, and present themselves as tiny red, or reddish-brown specks of the size of a pin's head, or smaller. To mention the further, or subsequent changes which are taking place, will not be necessary, for the same have but little bearing upon the subject. The question is what obstructs the capillaries? It, of course, must be something solid or corporeal, and I have not been able to find anything, except the swine-plague Schizophytes. It is true, the single and double micrococci, and the micrococcus-chains cannot and do not do it, for they are abundantly small to pass everywhere with the greatest facility where a blood corpuscle can pass, but these micrococci form zoöglœa-masses or coccoglia, which frequently are many times the size of a blood corpuscle, and therefore sufficiently large to clog the finer capillaries. Besides, some of the micrococci enter, or are taken up by the white blood corpuscles, and swell the latter not seldom to an abnormal size, or a size large enough to obstruct some of the finest capillary vessels. In all my examinations of diseased lung-tissue, and lung-exudation, these zoöglœa-masses and white blood corpuscles invaded by micrococci, have never been found missing, but always presented themselves in great, though somewhat variable numbers. No matter, in which way, or by what means the Schizophytes enter the animal organism, and get into the blood by being absorbed by the veins or by the lymphatics, the first capillary system to which they come, is in the lungs, which may account for the fact that in swine-plague morbid changes in the lungs, consisting in exudation, extravasation of blood, and finally hepatization are never absent. At least I found them at every post-mortem examination, and in the last three years I made about 300. Dr. James Law, of Ithaca, N. Y., in his report to the Commissioners of Agriculture, records the lungs of some of his experimental pigs as "healthy," "sound," "normal," etc., which simply shows that those pigs were *not* affected with swine-plague, and did *not* die of that disease. It may here also be mentioned that in all cases of swine-plague most of the lymphatic glands are more or less enlarged, and that comparatively more Schizophytes can be found

in the enlarged or swelled lymphatic glands, than in any other part of the animal's body.

8. In one and the same affected herd the older or more fully matured animals often recover, while nearly every young animal and particularly nearly every young pig under three months old, if once infested, will succumb to the disease, and is almost sure to die. This also may be considered as proof that the Schizophytes, or rather their zoöglœa-masses cause the disease by obstructing the capillaries. In older, and otherwise robust hogs the heart and the walls of the blood vessels are much stronger than in young pigs, and so it often happens that in the former the force of the blood current is strong enough to break and to disperse the zoöglœa-masses, and thus to free the obstructed passages, while in young, and especially in very young animals the pressure or the force of the blood current is insufficient, and then the passage is not freed, and exudation takes place, or the walls of the blood vessels are too weak, and then the latter yield and break and blood is extravasated. Usually both processes occur. Hence, while blood-extravasations in the lungs, are, as a rule, more frequent in young animals, other morbid changes brought about by Schizophytes, which have passed the capillary system in the lungs, and are forming their zoöglœa-masses in other parts or organs of the body, are on the whole more frequently met with in older hogs. Still, the latter, notwithstanding, have a much better chance of recovery than the former.

9. An animal which is recovering from an attack of swine-plague, or in which the morbid process has ceased to be active, will yet for sometime discharge swine-plague Schizophytes with its excretions, and is able to communicate the disease to other healthy animals by polluting their food or water for drinking, consequently the organism of such an animal is not destitute of the infectious principle, but contains an abundance of the same in a potent condition, while its own tissues have become sterile, or are not any more acted upon, because some of the conditions required by the Schizophytes to form zoöglœa-masses and to propagate have become exhausted. In the lungs of an animal which was butchered two months after recovery, I found an abundance of swine-plague Schizophytes, but no zoöglœa-masses. These facts, too, will be difficult of explanation, if a chemical poison or

virus, and not the Schizophytes constitute the infectious principle and the cause of the disease.

10. Swine-plague has a well-marked period of incubation, or as it has more appropriately been called stage of colonization, lasting from two to fifteen days, during which no morbid symptoms, with the exception, perhaps, of a somewhat higher temperature, can be observed. The average time which elapses after an inoculation or infection has taken place till plain symptoms of disease make their appearance, or till the morbid process has sufficiently advanced to produce external symptoms, or a visible disturbance of health, may be set down as from five to six days. All this is easily explained if Schizophytes constitute the cause, because those introduced from without are insufficient in numbers to cause at once important morbid changes; they must have time to undergo the necessary metamorphoses and to multiply within the animal organism, and this time varies according to the number of Schizophytes originally transferred to the condition or stage of development in which they are transferred, and to the degree of so-called predisposition or favorableness of conditions existing in the infected animal. As a rule, the larger the amount of the infectious material introduced and the richer the same in swine-plague Schizophytes, the shorter the period of incubation, or stage of colonization.

On the other hand, if the infectious principle were a chemical poison or virus, its action, one should suppose, would, under all circumstances be exactly the same, and the malignancy of the morbid process and the time required for its development would not be influenced by, or be dependent upon so many conditions, such as the individuality, age and temperature of the animal, the time and season of the year, the number and stage of metamorphosis of the Schizophytes contained in the infectious material and other yet unknown conditions. A poison or virus, indestructible by water and air, and not affected by dilution, no matter how far it may be carried, one should suppose, would act with great uniformity. Consequently one is obliged to conclude that the Schizophytes, and not a chemical virus, must, and do, constitute the cause.

11. The infectious principle undoubtedly consists in something that is destroyed and made ineffective by putrefaction, because infectious material, such as blood, blood serum, lung exudation,

other morbid products, etc., if putrefied, can be consumed by healthy animals without communicating the disease, and if used for inoculation, such putrefied material may cause septicæmia, but never produces a genuine case of swine-plague. Further, as has been previously mentioned, swine-plague Schizophytes cannot any more be found in the blood, blood serum, morbid tissues and morbid products, etc., of hogs which are diseased with, or have died of, swine-plague after putrefaction has set in, or in other words, after putrefaction bacteria, and particularly *Bacterium termo*, have made their appearance in large numbers. So, for instance, blood which has become sufficiently putrefied to assume a purplish color, is destitute of swine-plague Schizophytes. If these two facts are connected, it becomes evident that infectious substances or media lose their efficacy, or their power to communicate the disease to healthy animals simultaneously with the disappearance of the swine-plague Schizophytes, and *vice versa*, the latter disappear at the exact time at which the infectious substances or media cease to be infectious. Does this indicate a close relationship between the swine-plague Schizophytes and the infectious principle, or can such a remarkable coincidence be rejected as merely accidental? Further, is it more rational to accept as the cause and infectious principle of swine-plague, an unseen virus or something which nobody has ever produced, nor ever will produce, but which, notwithstanding, is indestructible by water, air and dilution, and possesses the remarkable property of making its exit at the *very* moment at which the swine-plague Schizophytes are destroyed, or caused to disappear by putrefaction, than to regard the latter, the Schizophytes, which do exist, are present, can be seen, have been shown and, moreover, possess all the properties and peculiarities manifested by the infectious principle, as the true cause of the morbid process and the propagators of the disease? I, for one should not think so.

12. It is an established fact that the morbid process, which invariably affects the lungs, will also develop in all such other parts or organs as may happen to be wounded, inflamed, or in a state of congestion—for particulars I have to refer to my reports—and thus some other parts besides the lungs may sometimes become just as much, or even more affected than the latter. So, for instance, if a pig has been ringed, or been castrated, and a perfect healing has not yet taken place when the animal becomes infected,

the parts yet more or less inflamed invariably become a prominent seat of the morbid process. All this is explained if the Schizophytes constitute the cause, as all recently wounded parts are comparatively rich in blood, and their capillaries, on account of the yet existing congestion or inflammation, are easily obstructed; but I should find it very difficult to give an explanation, if a poison or chemical virus constitutes the infectious principle and the cause of swine-plague. A chemical poison or virus, one should suppose, would possess special affinity to certain parts or tissues, and therefore cause the morbid process either to develop invariably in one and the same part of the body, or to attack in all cases the whole animal organism.

13. Antiseptics, or medicines, which are either directly poisonous to the lowest forms of organic life, or destructive to some of those conditions necessary to the metamorphoses and propagation of the simplest forms of organic life, such as Schizophytes, and among those antiseptics particularly carbolic acid, iodine, hyposulphite of soda, benzoate of soda, thymol, etc., have proved to be almost sure prophylactics. Their use, combined with strict separation, will prevent the outbreak of swine-plague in animals which have been inoculated or have undoubtedly become infected. As one of the conditions necessary to the development of swine-plague, it seems, must be considered a certain degree of animal heat. At any rate, after or while the animal heat of a pig is reduced by a continued treatment with carbolic acid from the normal 102 or 103° F., to an abnormally low temperature of a few degrees below 100—in several cases it was reduced to 96° and 97°—nearly every inoculation with fresh infectious material has proved to remain ineffective, and the few which did not remain ineffective were followed by an unprecedentedly long period of incubation and a very mild form of the disease. Comment will not be necessary. The various antiseptics which have proved to be good prophylactics, are very dissimilar in their chemical action and affinities, and therefore their prophylactic effect cannot very well be explained if the infectious principle consists in a chemical poison or virus, but admits explanation if something endowed with life and power of propagation constitutes the cause of swine-plague.